REMARKS

Applicants have carefully reviewed and considered the contents of the Office Action mailed February 9, 2004. Reconsideration of the rejection of claims 70-77 is respectfully requested in view of the comments set forth below.

By this Amendment, the title of the invention and the first page of the specification are amended to reflect the election of the method for monitoring a detection region of a working element. No amendments are made to the claims. Accordingly, claims 43-89 are pending in the application with claims 43-69 and 78-89 withdrawn from consideration as being directed to a non elected invention.

Claim 70 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,075,235 to Fembök as explained in paragraph 2, spanning pages 2-3, of the Action. Claims 71-76 were rejected under 25 U.S.C. § 103(a) as being unpatentable over Fembök in view of U.S. Patent No. 5,912,980 to Hunke as explained in paragraph 3, spanning pages 3-6, of the Action. Claim 77 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Fembök in view of Hunke and further in view of U.S. Patent No. 5,202,933 to Bloomberg as explained in paragraph 4 of the Action. These rejections are respectfully traversed.

As explained on page 5, lines 6 through page 6, line 8 of the Substitute Specification, the claimed inventive method is concerned with discerning an endangered object from a non-endangered object. For example, a person's hands or fingers (endangered object) can be

distinguished from a non-endangered object (workpiece). The claimed method for monitoring a detection region of a working element continuously monitors a detection region with at least one camera, reads image information, in the form of a color values, generated in the camera during the monitoring into an evaluation unit, distinguishes endangered objects from non-endangered objects with the evaluation unit based on the color values, disables the working element with the evaluation unit, if at least one endangered object is detected with at least one protection zone in the detection region, and enables the working element within the evaluation unit if no endangered object is located in the protection zone.

In contrast, Fembök is directed to an optical surveillance device where all active components are arranged on one side of the device. The active components taught by Fembök include an arrangement of lenses and reflectors which project images from the monitored region onto a CCD (charged-coupled device) camera. At the other end of the monitored region, a contrast pattern (pattern fields) including light and dark elements forms a passive element of the light grid arrangement taught by Fembök. Column 4, lines 6-20 of Fembök disclose the function of the detector as follows:

> "[W]when an object intrudes into the monitored area, such object will as a rule possess a different degree of brightness or color to the light area part and/or dark area part of the pattern field. The camera detects the difference in lightness or in color and the signal processing means will for example turn off the machine being monitored. A pattern field with light and dark area parts will ensure that even if the object intruding into the monitored area possesses the same color or brightness (lightness) as for example

> the light area part, the intrusion of such object will nevertheless be detected, because the object will then also cover the dark area part so that the detected optical characteristic will differ from those of the pattern field. It is in this manner that a reaction of the detector will be ensured on every intrusion by an object."

There is no support in this paragraph for the method step of "distinguishing endangered objects from non-endangered objects with the evaluation unit based on the color values", as claimed by Applicants. Fembök clearly detects every object to ensure that every intrusion results in a reaction. There is no distinguishing of objects.

The Action generalizes "background" as a non-endangered object and "an intruding object" as an endangered object. This is not distinguishing endangered objects from non-endangered objects as claimed by Applicants. The "background" is not an object and thus, cannot be considered as the claimed non-endangered object. Fembök teaches an optical surveillance device where any object entering the monitored region is considered an intruding object. There is no distinguishing or differentiation between an endangered object (such as an operator's fingers or hand) or a non-endangered object (e.g. workpiece).

The "background" mentioned in the Action is actually the contrast pattern or pattern field described by Fembök. It is respectfully submitted that the contrast pattern is not a non-endangered object in the monitored region, but is a component of the light grid and is located outside of the monitored region. Thus, the contrast pattern or pattern field is a tool used to detect

whether an object is intruding the monitored area, and not an object that intrudes the monitored area.

According to Fembök, the machine to be monitored is deactivated "on every intrusion by an object" (column 4, line 20 of Fembök). Fembök does not consider differentiating between objects in a monitored region. As explained in the Action, Fembök is concerned with "an intruding object [being] detected in the monitored area [so that] the signal processing 'will for example turn off the machine being monitored' (column 4, lines 11-12)" (page 3, lines 4-6 of the Action). Accordingly Fembök is silent about distinguishing endangered objects from non-endangered objects with the evaluation unit based on the color valued as claimed by Applicants. It is respectfully submitted that it is not possible to differentiate between objects in the monitored region with the type of system disclosed by Fembök. It is respectfully submitted that one of ordinary skill in the art would not have considered modifying Fembök to distinguish between intruding objects as Fembök teaches a detector that ensures that every intrusion by an object results in a reaction.

The method according to claim 70 of the present application does not employ a light grid. As a result, no contrast pattern is needed as a component of the light grid which delimits the monitored region. The object is therefore not detected through image difference comparison to the contrast pattern, but with the aid of a color analysis of objects in the monitored region. As a result, the claimed method can distinguish between two different objects in the monitored region.

These two objects can be classified via the color analysis as "endangered" and "non-endangered" objects. The machine to be monitored is deactivated only if an endangered object is arranged in the monitored region. On the other hand, if a non-endangered object is located in the monitored region, the machine remains active. Fembök does not address distinguishing or classifying two different objects, nor does Fembök even provide a suggestion or approach to classify objects. Accordingly, it is respectfully submitted that the subject matter of claim 70 is not rendered obvious by Fembök.

Claims 71-76 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Fembök in view of Hunke. Claim 71 recites that the image generated by the camera is read into the evaluation unit in the form of a pixel matrix with different color values. Dependent claim 72 recites further features of the distinguishing step, which Fembök does not disclose, teach or suggest. In particular, claim 72 assesses the color values with the threshold-value unit and creates binary images based on the assessment with the threshold-value unit. It is the Action's position that Hunke employs images obtained from a camera that are represented as a pixel matrix of RGB values in the internal memory of a computer system. However, Hunke is directed to a target acquisition and tracking method and also fails to describe, teach or suggest distinguishing objects into endangered and non-endangered objects. Thus, Hunke cannot cure the missing features of Fembök.

In contrast to Fembök, Hunke is concerned with detecting, locating and tracking distinctive target objects in an image. This is contrary to the optical surveillance device taught by Fembök which ensures a reaction of the detector on every intrusion by an object. Thus, it is unclear why one ordinary skill in the art would modify Fembök with the system for locating and tracking an object in an image as taught by Hunke. The Action lists advantages that Fembök is not concerned with: "the system can acquire and track targets automatically, and in an unsupervised manner (column 3, lines 27-33). The system acquires and tracks multiple targets simultaneously (column 3, lines 36-37). This system is capable of rapid adjustments to changing the lighting conditions and appearances of the tracked target, such as changes in the orientation (column 3, lines 37-40)." See page 4, lines 3-9 of the Action. Fembök is not concerned with the tracking objects but detecting all objects' presence in a monitored region. Accordingly, it is respectfully submitted that one of ordinary skill in the art would not have modified Fembök to include the color analysis system taught by Hunke because Fembök is not concerned with the tracking objects where the color analysis system is needed.

Hunke fails to disclose a step of distinguishing endangered objects from non-endangered objects with an evaluation unit based on color values. Hunke is limited to recording objects through detecting moving zones in video images. No objects are detected in Hunke that are subsequently classified as endangered or non-endangered objects. Dependent claim 72 further recites the distinguishing steps as including assessing the color values with the threshold-value

unit and creating binary images based on the assessment with the threshold-value unit. Ignoring the fact that Hunke does not concern itself with monitoring a detection region of a working element, the imaging processing technique taught by Hunke cannot be compared to the technique claimed in claims 72-76 of the present application. Hunke employs a "target color classifier function" as an interface between the RGB-values dependent on operational conditions and a representation independent of these factors, which is used to classify each color pixel as a target color or a non-target color. According to Hunke, a color is classified as a target color if it is a color typical for objects of the target class. The position of the object is tracked with an "individual target classifier" (ITCC). A binary image is generated only by means of the ITCC, in the sense that pixels which do not have the color of the target object are replaced by white pixels (paragraph 4, column 10 of Hunke). Thus, the color values read into the camera are not directly converted to binary images with the aid of a threshold-value unit.

Dependent claim 73 recites that the threshold-value unit is a component of a neural network. Column 9, lines 25-30 of Hunke describes "classifying a color as a target color if the $\overline{N}_{rg}$ exceeds a given threshold." That is, a standardized color distribution and not the pixel values directly read from the camera, are evaluated with a threshold value. Further, the neural network addressed in column 13, line 55 through column 14, line 44 of Hunke is used for classifying geometric image structures and is not used as a component of a threshold value for evaluating

pixel images as claimed by Applicants. Accordingly, the subject matter of claim 73 is not taught or suggested by Hunke.

Finally, the subject matter of claim 74-76 is not known from Hunke. Dependent claim 74 recites the features of the assessing step, while claim 75 and 76 address the learning process in which the endangered objects are established. The linear combination as detailed in claim 74 clearly refers to forming the threshold value, used to evaluate the pixel values in claims 70 and 71. The Action states that Hunke discloses the forming of a linear combination of color distribution functions but not the forming of pixel values. In that the assessing step is directed to the color values, it is believed that the claimed invention uses a linear combination to evaluate the pixel values. Accordingly, Hunke fails to disclose, teach or suggest the features in claim 74-76.

As stated above, Hunke does not disclose the distinguishing step that is missing from Fembök. Further, the Action's explanations why one of ordinary skill in the art would modify the teachings of Fembök are not persuasive. While Hunke may distinguish objects from a background, Hunke also refers to suppressing background effects. Nowhere does Hunke disclose, teach or suggest differentiating objects in the image as being endangered or non-endangered objects as claimed by Applicants.

Finally, the last paragraph in column 7 of Hunke shows that this system cannot be used for safety-critical uses, as is the purpose of the claimed method for a detection region of a

working element. Hunke states that objects can be distinguished from a background only by tracking their movement. However, safety systems, such as the one forming the subject matter of the claimed invention, are designed to detect endangered and non-endangered objects independent of their state of movement. For example, if a person's hand is not moving and it is in the monitored area, the machine of the claimed invention will be disabled because the claimed invention will distinguish the hand from the workpiece.

Dependent claim 77 recites an additional step of forming a connected region of foreground pixels in the binary images generated by the threshold-value unit to represent the endangered objects; and eliminating individual foreground pixels in the background around the connected region using morphological operators. The Action admits that this approach is described neither in Fembök nor in Hunke, but applies Bloomberg for its teaching of eliminating noise influences during the extraction of texts in images. Bloomberg is directed to the segmentation of text and graphics and is not concerned with monitoring a detection region of a working element. Thus, Bloomberg also fails to teach the distinguishing step of claim 70.

It is respectfully submitted that this Amendment and Request for Reconsideration clearly points out why Fembök, Hunke and Bloomberg do not teach each and every claimed element and why one of ordinary skill in the art would not have been motivated to combine the secondary references with Fembök, yet alone achieve the claimed invention. Accordingly, it is respectfully

submitted that claims 70-77 are allowable over the prior art of record and Applicants request the issuance of a Notice of Allowability indicating the same.

A Petition for Extension of Time Under 37C.F.R. 1.136(a) is being filed concurrently herewith, and a check in the amount of $55.00 (small entity) for the one-month extension-of-time fee is also attached. Should the check be inadvertently missing, however, please charge the fee to our Deposit Account No. 22-0261, and notify the undersigned accordingly.

Should the Examiner believe that a conference would advance the prosecution of this application, the Examiner is requested to telephone the undersigned counsel to arrange such a conference.

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